Capsule Summary

The Subsonic Wind Tunnel Complex at the Naval Surface Warfare Center Carderock Division was established in 1943 to augment the Navy's aeronautical research program. Between 1943 and 1955, the complex was expanded as needs dictated and funding allowed. Located within the current boundaries of the installation, the Subsonic Wind Tunnel Complex is an integral part of the larger naval test complex at Naval Surface Warfare Center Carderock Division (NSWCCD). The six buildings and structures associated with the Subsonic Wind Tunnel Complex were identified as contributing elements within the larger Naval Surface Warfare Center Carderock Division (NSWCCD) Historic District in 1996 (Melhuish 1996a). The Subsonic Wind Tunnel Complex was fully documented in 1996 for the Historic American Engineering Record (HAER) in anticipation of its adaptive reuse (Melhuish 1996b). This Maryland Inventory of Historic Properties form provides documentation for the Subsonic Wind Tunnel No. 2 (Building 139), Cooling System No. 2 (Building 141) and the Compressor House (Building 163) prior to demolition. These buildings are no longer operational and were decommissioned in 1991.

Survey No. M-29-54

Magi No.

DOE __yes __no

Maryland Historical Trust
State Historic Sites Inventory Form

1. Name (indicate preferred name)

historic Subsonic Wind Tunnel Complex, Buildings 139, 141, and 163

and/or common

2. Location

street & number Naval Surface Warfare Center, Carderock Division (NSWCCD) __ **not for publication**

city, town Bethesda N/A **vicinity of** 8th **congressional district**

state Maryland **county** Montgomery

3. Classification

Category	Ownership	Status	Present Use	
___ district	_x_ public	___ occupied	___ agriculture	___ museum
_x_ building(s)	___ private	_x_ unoccupied	___ commercial	___ park
___ structure	___ both	___ work in progress	___ educational	___ private residence
___ site	**Public Acquisition**	**Accessible**	___ entertainment	___ religious
___ object	___ in process	_x_ yes: restricted	___ government	___ scientific
	___ being considered	___ yes: unrestricted	___ industrial	___ transportation
	_x_ not applicable	___ no	_x_ military	___ other:

4. Owner of Property (give names and mailing addresses of all owners)

name U.S. Navy

street & number Naval Surface Warfare Center Carderock Div. telephone no.:

city, town Bethesda state and zip code Maryland

5. Location of Legal Description

courthouse, registry of deeds, etc. Land Records Office liber

street & number Montgomery County Courthouse folio

city, town Rockville **state** Maryland

6. Representation in Existing Historical Surveys

title HAER No. 118A Naval Surface Warfare Center: Subsonic Wind Tunnel Complex

date September 26, 1996 _x_ **federal** ___ **state** ___ **county** ___ **local**

pository for survey records Maryland Historical Trust

city, town Crownsville **state** MD 21032

7. Description

Survey No. M:29-54

Condition		Check one	Check one
___ excellent	___ deteriorated	X unaltered	X original site
X good	___ ruins	___ altered	___ moved date of move _____
___ fair	___ unexposed		

Prepare both a summary paragraph and a general description of the resource and its various elements as it exists today.

See Continuation Sheets

8. Significance

Survey No. M:29-54

Period	Areas of Significance—Check and justify below				
___ prehistoric	___ archeology-prehistoric	___ community planning	___ landscape architecture	___ religion	
___ 1400–1499	___ archeology-historic	___ conservation	___ law	___ science	
___ 1500–1599	___ agriculture	___ economics	___ literature	___ sculpture	
___ 1600–1699	___ architecture	___ education	_X_ military	___ social/ humanitarian	
___ 1700–1799	___ art	_X_ engineering	___ music	___ theater	
___ 1800–1899	___ commerce	___ exploration/settlement	___ philosophy	___ transportation	
_X_ 1900–	___ communications	___ industry	___ politics/government	___ other (specify)	
		___ invention			

Specific dates **Builder/Architect**

check: Applicable Criteria: X A __B X C __D
and/or
Applicable Exception: __A __B __C __D __E __F __G

Level of Significance: X national __state __local

Prepare both a summary paragraph of significance and a general statement of history and support.

See Continuation Sheets

9. Major Bibliographical References

Survey No. M:29-54

See Continuation Sheet

10. Geographical Data

Acreage of nominated property less then .5 acres

Quadrangle name Falls Church, Virginia **Quadrangle scale** 1:24:000

UTM References do NOT complete UTM references

	Zone	Easting	Northing
A	18	309760	4316090
B			
C			
D			
E			
F			
G			
H			

Verbal boundary description and justification

The boundary of the property occupies the footprint of the buildings within the Naval Surface Warfare Center Carderock Division (NSWCCD) Historic District.

List all states and counties for properties overlapping state or county boundaries

state	code	county	code
state Maryland	code MD	county	code

11. Form Prepared By

name/title W. Patrick Giglio, Architectual Historian

organization R. Christopher Goodwin & Assoc., Inc. **date** October 7, 1999

street & number 241 East 4th Street, SUite 100 **telephone** (301) 694-0428

city or town Frederick **state** Maryland 21701

The Maryland Historic Sites Inventory was officially created by an Act of the Maryland Legislature to be found in the Annotated Code of Maryland, Article 41, Section 181 KA, 1974 supplement.

The survey and inventory are being prepared for information and record purposes only and do not constitute any infringement of individual property rights.

return to: Maryland Historical Trust
Shaw House
21 State Circle
Annapolis, Maryland 21401
(301) 269-2438

PS-2746

Summary Description

Naval Surface Warfare Center Carderock Division (NSWCCD) occupies 183.6 acre in the Potomac River Valley, near Bethesda, in Montgomery County, Maryland. NSWCCD is located approximately 12 miles northwest of Washington, D.C. The installation is bordered on the south by the Clara Barton Parkway and on the north and east by MacArthur Boulevard.

The Subsonic Wind Tunnel Complex is a cohesive collection of buildings and structures constructed between 1943 and 1955 at the Naval Surface Warfare Center Carderock Division (NSWCCD). Six buildings comprise the Subsonic Wind Tunnel Complex. The Wind Tunnel Laboratory (Building 7), Subsonic Wind Tunnel No. 1 (Building 138), and Subsonic Wind Tunnel No. 2 (Building 139) were the first buildings constructed in 1943. In 1945, Cooling System No. 1 (Building 140) was added to Subsonic Wind Tunnel No. 1, and Cooling System No.2 (Building 141) was added to Subsonic Wind Tunnel No. 2 to control the increases in temperature caused by the test fans and air friction upon the tunnel walls. In 1955, a compressor house (Building 163) was constructed south of Subsonic Wind Tunnel No. 2 to supply additional air flow (Melhuish 1996b). This Maryland Inventory of Historic Properties Form provides documentation for Subsonic Wind Tunnel No. 2 (Building 139), Cooling System No. 2 (Building 141) and the Compressor House (Building 163) prior to demolition. These buildings are no longer operational and were decommissioned in 1991.

Subsonic Wind Tunnel No. 2 (Building 139) is located south of the Wind Tunnel Laboratory (Building 7). Testing apparatus associated with the subsonic wind tunnel comprise the test section and wind tunnel control room located within the Wind Tunnel Laboratory (Building 7). The test section located on the upper tier above the wind tunnel control room is constructed of welded steel with inset wood panels, for easy alterations. Scale models were placed in the test section. The tunnel control room located below the test sections contains scales used to display force and moment during testing. The tunnel control room also houses the mechanical equipment used to manipulate models during testing. The 8 x 10 foot subsonic wind tunnel was designed by the Bureau of Yards and Docks and is identical to Subsonic Wind Tunnel No. 1 (Building 138) located north of the Wind Tunnel Laboratory (Building 7). These two identical general purpose wind tunnels are continuous flow, closed-throat, single return types with vented sections.

The wind tunnel is constructed of welded steel panels. The wind tunnel is supported by a metal superstructure that is bolted to concrete pads. Most of the tunnel's circuit is located outside of the Wind Tunnel Laboratory (Building 7), which permits temperature control by means of a recirculating water system (Building 141). The tunnel rests above a large sloping concrete basin that drains into a concrete sump located on the western edge of the tunnel.

The drive system for the wind tunnel consists of a 700 horsepower General Electric main drive electric induction motor enclosed within the southern section of the tunnel (Melhuish 1996b). A sixteen-foot, four-bladed fan made of Sitka spruce is mounted directly onto the motor shaft. Seven fixed wooden stator blades are mounted behind the fan. The tunnel features a unique four blade free-wheeling windmill located downstream from the fan assembly. The purpose of the windmill is to equalize the high and low pressure systems of the air stream into one velocity, so accurate results can be achieved. Slots on each side

of the wind tunnel test chamber allow air to be transferred between the wind tunnel and the outside. The transfer of air keeps the pressure within the tunnel and outside of the tunnel constant. A series of metal screens, referred to as turning vanes, are located in corners of the tunnel to direct and stabilize the airflow (Melhuish 1996b).

Cooling System No 2. (Building 141) was added on top of Subsonic Wind Tunnel No. 2 (Building 139) in 1945 to control the increase in temperature caused by the test fans and air friction upon the tunnel walls (Melhuish 1996b). The cooling system consisted of a series of metal sprinkler heads connected by metal pipes suspended above the exterior of the wind tunnel. The sprinkler heads diffused water on the exterior of the wind tunnel. Cooling resulted from both evaporation and the constant flow of water down the sides of the tunnel. The water was then collected in a large sloping concrete basin located below the tunnel that drains into a concrete sump located on the western edge of the tunnel and recirculated through the system.

Compressor House (Building 163) was constructed in 1955 to house a high pressure booster capable of producing 200 psi of compressed air. The purpose of the pump was to introduce forced air into the wind tunnel chamber to increase test speeds. The one-story, rectangular, concrete-block building rests on a poured concrete slab. The walls terminate in a flat roof with parapet sheathed with built-up asphalt. The west elevation exhibits a metal overhead track door. A twenty-light, metal-frame, industrial sash window is located on the south elevation. The building houses a Carter Denver Booster Pump that could introduce compressed air directly into the wind tunnel or to a one-story storage tank located west of the building. The storage tank was removed during the 1980s.

Summary of Significance

The Subsonic Wind Tunnel Complex, associated with the facilities aeronautical test activities is a cohesive collection of buildings and structures, constructed between 1943 and 1955 at the Naval Surface Warfare Center Carderock Division (NSWCCD). The Subsonic Wind Tunnel Complex is comprised of six buildings and structures constructed during the period of significance (1943-1955), and include the Wind Tunnel Laboratory (Building 7), Subsonic Wind Tunnel No. 1 (Building 138), Subsonic Wind Tunnel No. 2 (Building 139), Cooling System No. 1 (Building 140), Cooling System No.2 (Building 141) and the Compressor House (Building 163). This aeronautical test complex represents a contributing component to NSWCCD's larger naval testing facility, including the David Taylor Model Basin (listed in the National Register of Historic Places in 1985), a Circulating Water Channel, and an Underwater Explosion Laboratory. The primary mission of NSWCCD, established in 1940, was to undertake naval engineering testing activities originally assigned to the Washington Navy Yard.

The Subsonic Wind Tunnel Complex was assessed on its individual merit, as well as a contributing element to the NSWCCD facility, applying the National Register criteria for evaluation. Since the Compressor House (Building 163) does not meet the National Registers 50- year old age criteria, it was evaluated under the criterion consideration for *exceptional* significance. Additional guidance developed by the Department of Defense (DoD) was also referenced. The U.S. Air Force has developed preliminary guidance for evaluation and treatment of Cold War related resources under the control of their military branch, which utilize a thematic approach.

The Subsonic Wind Tunnel Complex, which was evaluated within the thematic context of military aeronautical testing (Criterion A) did not possess exceptional significance on an individual basis. Based on available archival data the complex was not determined to be of exceptional significance in illustrating significant advancements in aeronautical test activities. The Subsonic Wind Tunnel Complex is, however, a contributing element to a larger NSWCCD naval test facility historic district. This district was determined to possess exceptional significance for its crucial role in conducting naval research, development, and test activities for the Department of the Navy (Criterion A), and for representing an intact collection of integrated naval defense test systems (Criterion C). The Subsonic Wind Tunnel Complex buildings have been identified as contributing elements within the Naval Surface Warfare Center Carderock Division (NSWCCD) Historic District (Melhuish 3/6/1996). A Historic American Engineering Record (HAER) recordation of the Subsonic Wind Tunnel Complex was also completed in 1996 in anticipation of its adaptive reuse (Melhuish 9/26/1996). Architectural investigations are currently being undertaken to document Subsonic Wind Tunnel No. 2 (Building 139), the Cooling System No. 2 (Building 141) and the Compressor House (Building 163) prior to demolition to the standards of the Maryland Historical Trust. These buildings are no longer operational and were decommissioned in 1991. Selective materials from these building will be salvaged prior to demolition for reuse in the existing Wind Tunnel Laboratory (Building 7) and Subsonic Wind Tunnel No. 1 (Building 138).

History

The Subsonic Wind Tunnel Complex at the Naval Surface Warfare Center Carderock Division was constructed in 1943 to augment the Navy's aeronautical research program. Rapid advancements in aerodynamics required more sophisticated and specialized testing facilities than those located at the Washington Navy Yard. On 17 March 1941, Congress authorized $500,000 for the construction of wind tunnels at Carderock, Maryland. Since the facilities were the only wind tunnels within the Navy at the time, it was decided that the new wind tunnels would be of a general purpose type so that all branches of the U.S Navy could utilize them. Under the direction of Captain Walter S. Diehl with assistants R. H. Helmholz, J.N. Fresh, and R.H. Peterson, a one-sixth scale model tunnel was designed and tested to establish the geometrical and power details. When the model tunnel was accepted, the decision was made to construct two similar wind tunnels with 8-by-10 foot test sections and a laboratory. The design of the new wind tunnels were intended to be adaptable to a variety of testing scenarios. The tunnels would accommodate moderate speeds, reasonably size, and have the ability to test a wide variety of aircraft, ships, and components (Fresh 1964: 20). The wind tunnels were designed for testing existing material rather than as a research operation.

Construction began in February 1942, according to designs by the Bureau of Yards and Docks in 1941. The new facility included a laboratory, a model shop, and two subsonic wind tunnels. The cost of construction of Building 7 was $482,774 and the combined cost of the twin subsonic wind tunnels was $268,413. Subsonic Wind Tunnel No. 1 (Building 138) was first operated on 21 September and Subsonic Wind Tunnel No. 2 (Building 139) was in service about a week later. On 21 April 1944, the first tests were conducted on parachutes. Further testing of scale model aircraft and airborne equipment enabled the laboratory to predict the performance of full scale designs and modify existing equipment. Toward the end of World War II, the invention of the jet engine greatly increased the operational speeds of aircraft, and high speed facilities were needed to solve new problems that accompanied increased performance (Fresh 1964:22).

Minor modifications have been made to the Subsonic Wind Tunnel Complex, in particular the Wind Tunnel Laboratory (Building 7) since its construction. In 1954, a portion of the return passage was altered to permit testing on Vertical/Short Takeoff and Landings (V/STOL) models at low forward and transitional speeds. The second major change to the Subsonic Wind Tunnel Complex occurred in 1955 when Building 163 was constructed south of Subsonic Wind Tunnel No. 2 (Building 139) to house a Carter Denver Booster Pump. The purpose of the pump was to introduce forced air into the wind tunnel chamber to increase test speeds.

Throughout the 1950s, the Aeronautical Laboratory at Carderock concentrated its efforts on improving the aerodynamic qualities of missiles and aircraft, assisting in the development of new designs, and the modification of existing equipment. The laboratory provided minor support to aircraft and weapon

development programs. The facility was not viewed as a major center or contributor in the research and development of aerodynamic aircraft (Maguire 1995:1).

The Subsonic Wind Tunnel Complex is a cohesive collection of buildings that were constructed to replace the outdated facilities at the Washington Navy Yard. This complex also was constructed to augment the aeronautical research and development ongoing within the Navy at other facilities. The Subsonic Wind Tunnel Complex were used primarily for support testing and was not directly involved in events of exceptional significance in the history of Naval Aviation (Criterion A). Under direct charge of the Bureau of Aeronautics, this complex was not associated with individuals whose specific contributions can be identified (Criterion B). Designed by the Bureau of Yards and Docks as utilitarian resources, the buildings are not exceptional examples that embody distinctive characteristics of a type, period or method of construction (Criterion C). The structures inside, although retaining their overall integrity, were designed and used as a standard design-test facility, rather than a research operation. The designs behind construction of the wind tunnels were based on proven designs and methods utilized by the NACA facility at present day Langley Air Force Base (Criterion C).

While the Subsonic Wind Tunnel Complex at NSWCCD is not individually of exceptional significance, the complex is a contributing element to an historic district of exceptional significance to naval research, development and testing. From the early beginnings of NSWCCD as the David Taylor Model Basin through the technological expansion of World War II and into the Cold War Era, the facilities at NSWCCD have established themselves as the lead Activity for the U.S. Navy's research, development, testing and evaluation center for naval vehicles. Working together with a direct relationship to the installations mission, the laboratories have conducted studies in ship, aircraft and subsurface technology, ship design and construction and material technology with unmatched capabilities.

MARYLAND HISTORICAL TRUST

Eligibility Recommended X Eligibility Not Recommended _____

Criteria: X A ___ B X C ___ D Considerations: ___A ___B ___C ___D ___E ___F ___G ___None

Comments: _____

Reviewer, OPS: _____ Date: 1/20/00

Reviewer, NR Program: _____ Date: 2/9/00

HISTORIC CONTEXT

MARYLAND COMPREHENSIVE HISTORIC PRESERVATION PLAN DATA

- Geographic Organization: Piedmont
- Chronological/ Development Period: Modern Period (1930- Present)
- Historic Period Theme: Military
- Resource Type:

  Category: Buildings, Structures

  Historic Environment: Research and Testing Laboratory Complex

  Historic Function and Use: Wind Tunnels

Major Bibliographical References

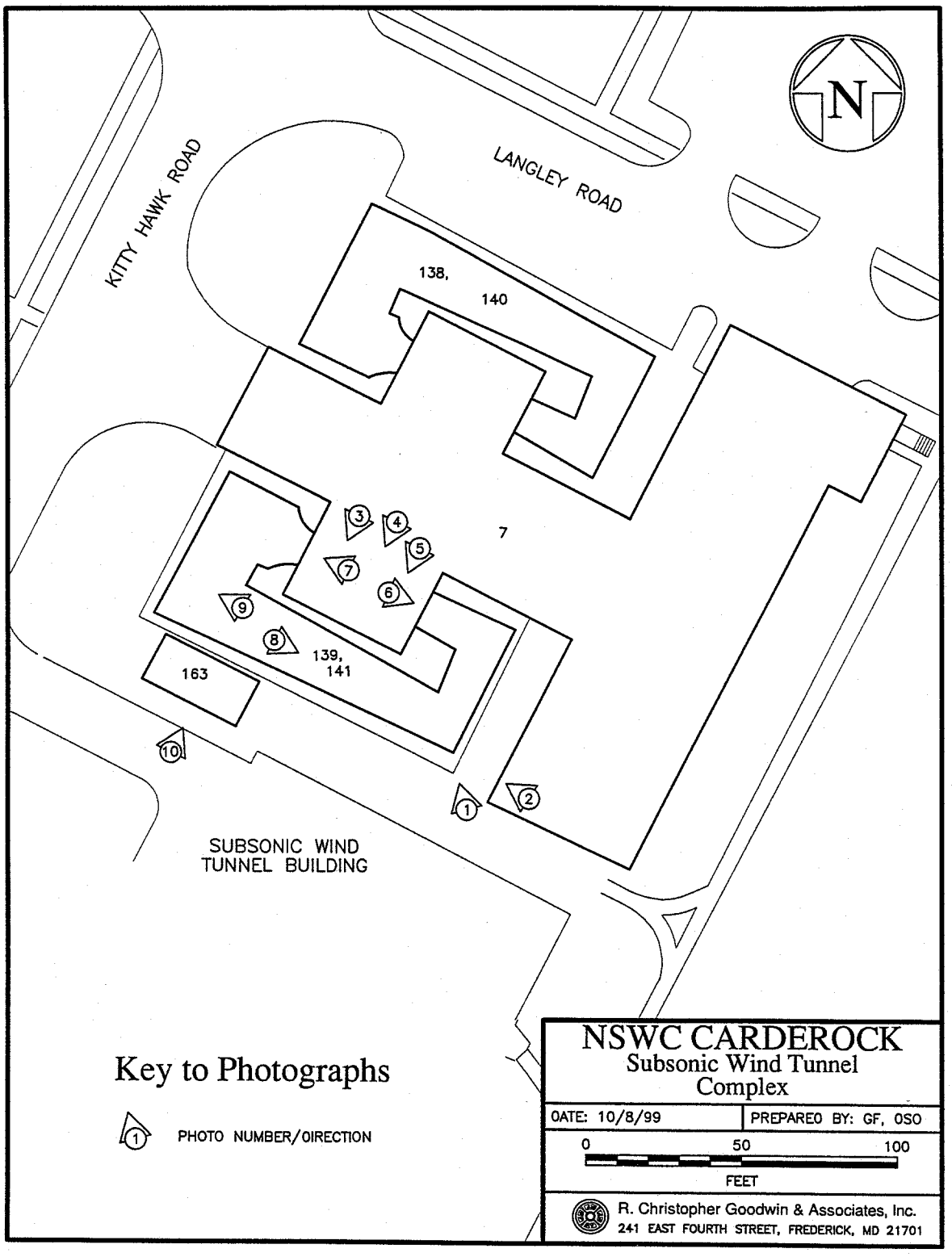
Fresh, Norman J.

1964 *The Aerodynamics Laboratory (The First 50 Years).* Aero Report 1070.

Melhuish, Geoffrey Eden

1996 a *National Register Nomination: Naval Surface Warfare Center Carderock Division (NSWCCD) Historic District.* Prepared by R. Christopher Goodwin and Associates Inc. for Engineering Field Activity-Chesapeake, Washington D.C. 3/6/1996.

1996b *Historic American Engineering Record, Naval Surface Warfare Center: Subsonic Wind Tunnel Complex (Naval Surface Warfare Center Buildings No. 7, 138, 139, 140,and 141) HAER No. MD-118-A.* Prepared by R. Christopher Goodwin and Associates Inc. for Engineering Field Activity-Chesapeake, Washington D.C. 9/26/96.


N
KITTY HAWK ROAD
LANGLEY ROAD
138,
140
7
139,
141
163
SUBSONIC WIND
TUNNEL BUILDING
Key to Photographs
PHOTO NUMBER/DIRECTION
NSWC CARDEROCK
Subsonic Wind Tunnel
Complex
DATE: 10/8/99
PREPARED BY: GF, DSO
0
50
100
FEET
R. Christopher Goodwin & Associates, Inc.
241 EAST FOURTH STREET, FREDERICK, MD 21701

M:29-54

MHT# M-29-54
Subsonic Wind Tunnel Complex
Buildings 139, 141, and 163
NSWC Carderock Division
Montgomery Co., Maryland
Photo List

INDEX TO PHOTOGRAPHS

The same is the following for all photographs:

1. inventory #: M-29-54
2. historic name: Subsonic Wind Tunnel Complex Buildings 139, 141 and 163
3. location: Bethesda, Montgomery County
4. photographer: B. Cleven
4. date of photograph: September 1999
5. location of negative: MD SHPO

Photo #

1. View Exterior Buildings 139, view west

2. View Exterior Buildings 139 and 141, view west

3. View Interior Building 7 depicting testing section (above) and control room (below), view south

4. View Interior Building 7, depicting interior of control room, view south

5. View Interior Building 7, depicting interior test section, view south

6. View Interior Building 7, depicting interior of test section, view east

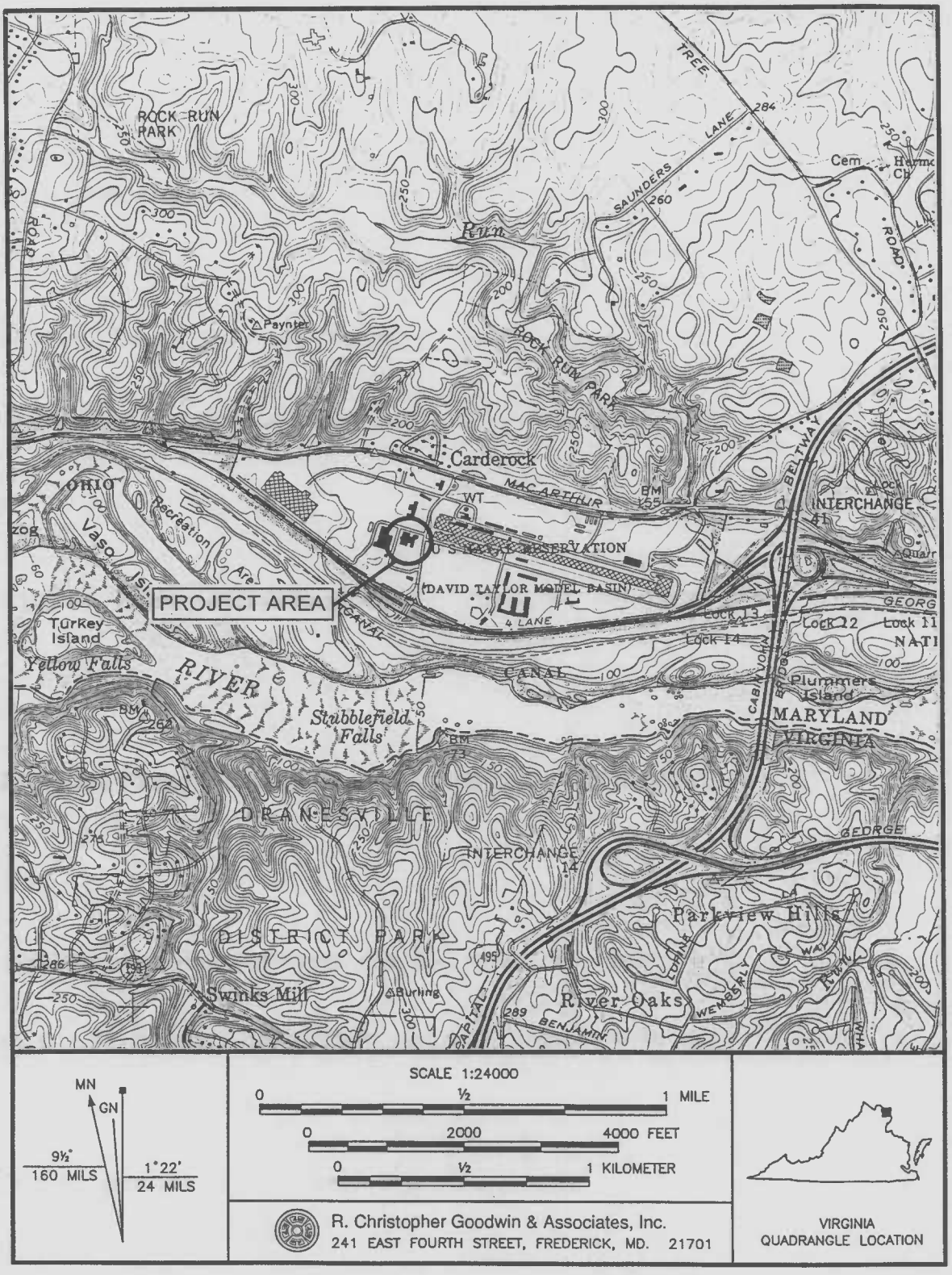
7. View Interior Building 7, depicting interior of test section, view west

8. View Interior Building 139, depicting drive system, windmill in foreground, view east

9. View Interior Building 139, depicting turning vane, view west

10. View Exterior Building 163, view north

M: 29-54



Excerpt from the USGS 7.5 min. Falls Church, VA (1965, photorevised 1984) quadrangle showing location of Subsonic Wind Tunnel Complex.

M-29-54

Subsonic Wind Tunnel Complex Bldgs. 139, 141-163
Bethesda, Montgomery Co.
B. Cleven
9/1999
MD SHPO
View Exterior Bldg 139, view west
1 of 10

M-29-54

Subsonic Wind Tunnel Complex Bldgs 139, 141, & 163
Bethesda, Montgomery Co
B. Cleven
4/1999
MD SHPO
View Exterior Bldgs 139 & 141, view west
2 of 16


WIND TUNNEL NO. 2
Advanced Fluid Flow

M-29-54

Subsonic Wind Tunnel Complex Bldgs 139, 1411 & 163
Bethesda, Montgomery Co.
B. Cleven
9/1999
MD SHPO
View Interior Bldg. 7 depicting testing area and control room, view south
3 of 10

M-29-54
Subsonic Wind Tunnel Complex Bldgs 139, 141 & 163
Bethesda, Montgomery Co.
B. Cleven
9/1999
MD SHPO
View Interior Bldg 7 depicting control room, view south
4 of 10


WIND TUNNEL NO. 2

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Subsonic Wind Tunnel Complex Bldgs 139, 141 & 163
Bethesda, Montgomery Co.
B Cleven
9/1999
MD SHPO
View Interior Bldg 7 ~~depicting testing~~ area, view south
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Subsonic Wind Tunnel Complex Bldgs 139, 141 & 163
Bethesda, Montgomery Co.
B. Cleven
9/1999
MD SHPO
View Interior Bldg. 7 depicting testing area, view east
6 of 10

M-29-54

Subsonic Wind Tunnel Complex Bldgs. 139, 141 & 163
Bethesda, Montgomery Co
B. Cleven
9/1999
MD SHPO
View Interior Bldg. 7 depicting testing area, view west
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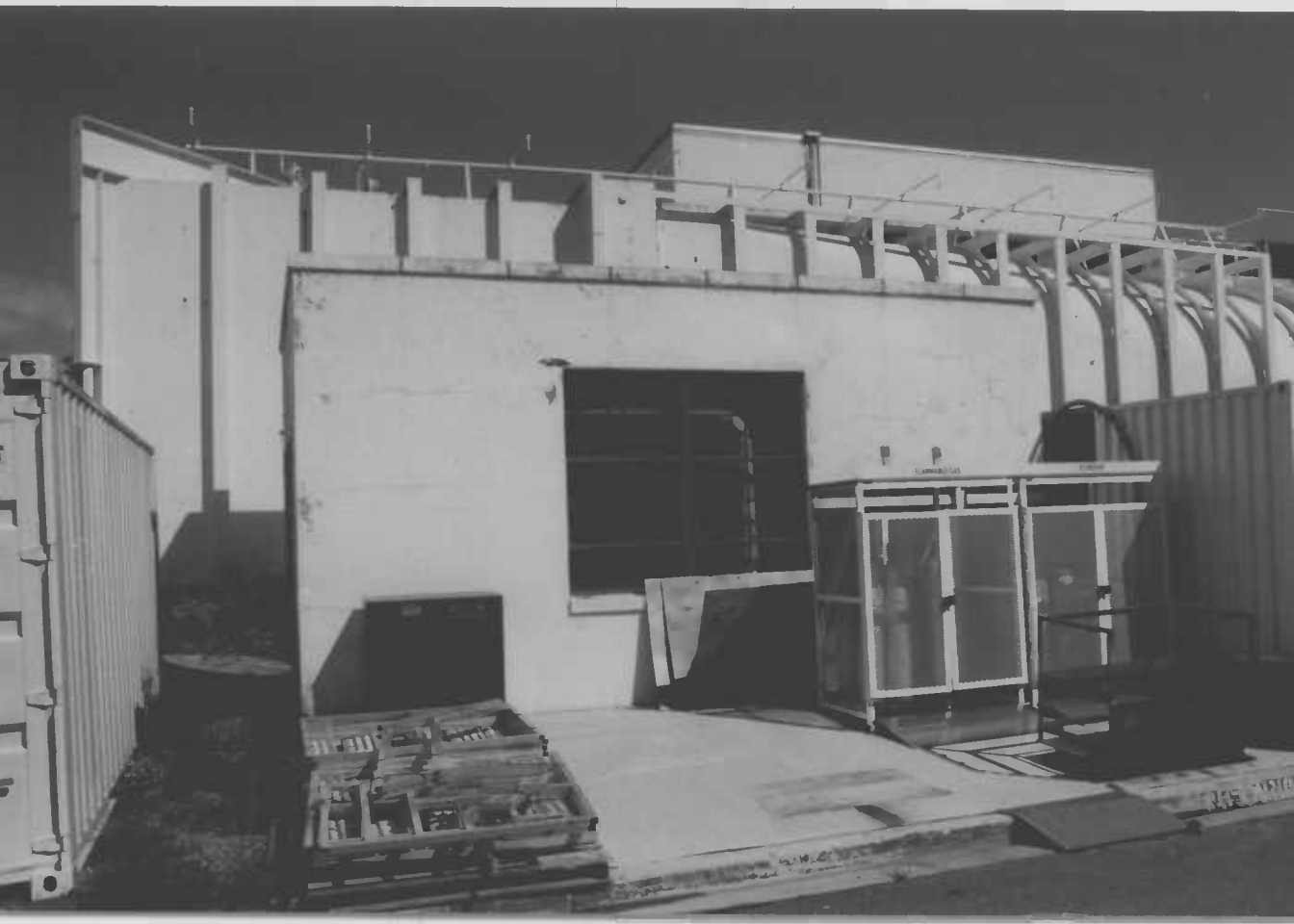
M-29-54
Subsonic Wind Tunnel Complex Bldgs 139, 141, & 163
Bethesda, Montgomery Co.
B. Cleven
9/1999
MD SHPO
View Interior Building 139 depicting drive system, view east
8 of 10

M-29-54
Subsonic Wind Tunnel Complex Bldgs. 139, 141 & 163
Bethesda, Montgomery Co.
B. Cleven
9/1999
MD SHPO
View Interior Building 139 depicting turning vane, view west
9 of 10



M-29-54
Subsonic Wind Tunnel Complex Bldgs. 139, 141 & 163
Bethesda, Montgomery Co.
B. Cleven
9/1999
MD SHPO
View Exterior Building 163, view north
10 of 10